Planar silicon CMOS technology silicon nanowires based sensors

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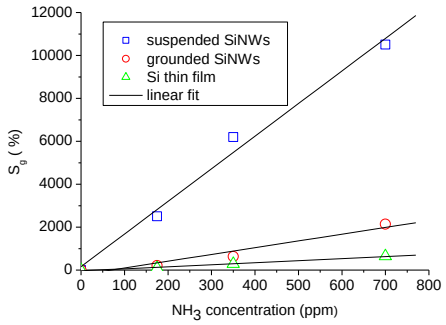
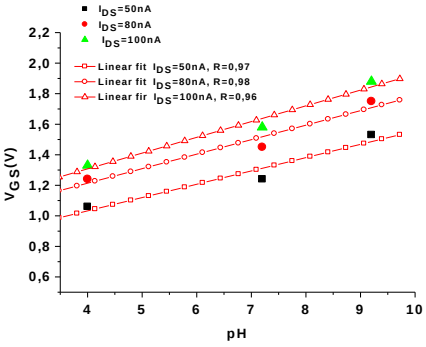
Owing to their physical and electrical properties, silicon nanowires (SiNWs) are currently attracting much attention as promising components for future nanoelectronic devices such as nanowire field effect transistors, photovoltaic devices and bio-chemical sensors. The need of a fast and precise detection of early disease symptoms, as well as the need of environment safety, becomes now the main leitmotivs of the societal development. The incorporation of semiconductor nanowires into the chemical and biological sensor application receives a great interest. Thanks to their high surface to volume ratio, SiNWs are the subject of intense research activities because of their potential applications in sensing biological and chemical agents in solutions and gas environment.
Resistors and Field Effect Transistors based on polycrystalline SiNWs are fabricated using the classical top down CMOS silicon planar technologies. Nanowires are fabricated following the sidewall spacer formation technique [1]. Results show potential use as sensitive units of silicon nanowires for charged chemical species (ammonia, pH) detection. Devices are promising as low-cost manufacturing very high sensitive sensors.



Sensor responses versus different concentrations of NH_3, for grounded SiNWs, suspended SiNWs, and thin film silico based resistors



pH sensitivity of a field effect transistor based on silicon nanowires

Références :

[1] F. Demami, L. Pichon, R. Rogel., A. C. Salaun, Materials Science and Engineering **2009**, 6, 012014.